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SILVER AND BISMUTH OF GALENA FROM THE BRUNSWICK NO. 12 MINE

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MICROMEDIA

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SILVER AND BISMUTH CONTENTS OF GALENA FROM THE BRUNSWICK No. 12 MINE

by

J.H.G. Laflamme & L.J. Cabri

SUMMARY

The median silver content of galena from the mill circuit (1985) of Brunswick Mining and Smelting Corporation Limited (N.P.L.) was determined to be 0.075 wt. % with 94.5% of the analyses >0.02 and <0.13 wt. % Ag. The silver content of galena is thus about 10% less than was reported by Owens (1980) for galena representative of ore mined in 1977. The bismuth content varied from less than the detection level (0.07 wt. %) to a high value of 0.47 wt. %.

TENEURS EN ARGENT ET EN BISMUTH DE LA GALÈNE PROVENANT DE LA MINE BRUNSWICK NO. 12

par

J.H.G. Laflamme et L.J. Cabri

RÉSUMÉ

La teneur médiane en argent de la galène provenant du circuit de traitement (1985) de la Brunswick Mining and Smelting Corporation Limited, (N.P.L.), a été déterminée à 0,075 % en poids et la teneur en argent de 94,5 % des analyses tombe entre >0,02 et <0,13 % en poids. La teneur en argent de la galène se situe à environ 10 % de moins que la teneur en argent déterminée par Owens (1980) pour la galène contenue dans le minerai exploité en 1977. La teneur en bismuth varie d'une valeur plus basse que le niveau de détection (0,07 % en poids) à une valeur élevée de 0,47 % en poids.

INTRODUCTION

Two hundred and forty galena grains from Brunswick Mining and Smelting Corporation Limited (N.P.L.) (BMS) were analysed for silver with an electron microprobe by Owens (1980). These samples came from ore mined in 1977. It was considered necessary to analyse a new series of samples to determine possible variations in silver content of galena between currently mined ore and that mined in 1977. Additionally, analyses with the new electron microprobe were expected to have an analytical limit of detection lower than the 350 ppm reported by Owens (1980).

SAMPLES

Three samples were examined, Samples "A", "B" and "C". Sample "A" was a 2-kg secondary cyclone underflow, provided by L.J. Surges of BMS, in September 1985. A portion of a table concentrate (prepared from a 1-kg split by the Mineral Dressing Section) was mounted in polished section for this study. Microscopic examination of this concentrate revealed that it consists mainly of galena, with minor pyrite and sphalerite and traces of chalcopyrite and arsenopyrite. Sample "B" consists of hand samples of coarse-grained high-grade ore collected by W.M. Luff of BMS in 1985 (Table 1). Sample "C" consists of diamond drill core samples collected by CANMET personnel in 1975 (Table 1). Galena-rich fragments from samples "B" and "C" were mounted in one polished section. Unfortunately, not all samples within Sample "B" were suitable for electron microprobe analyses due to the presence of numerous very fine-grained inclusions of silver minerals such as diaphorite ($Pb_2Ag_3Sb_3S_8$), shown in Figure 1.

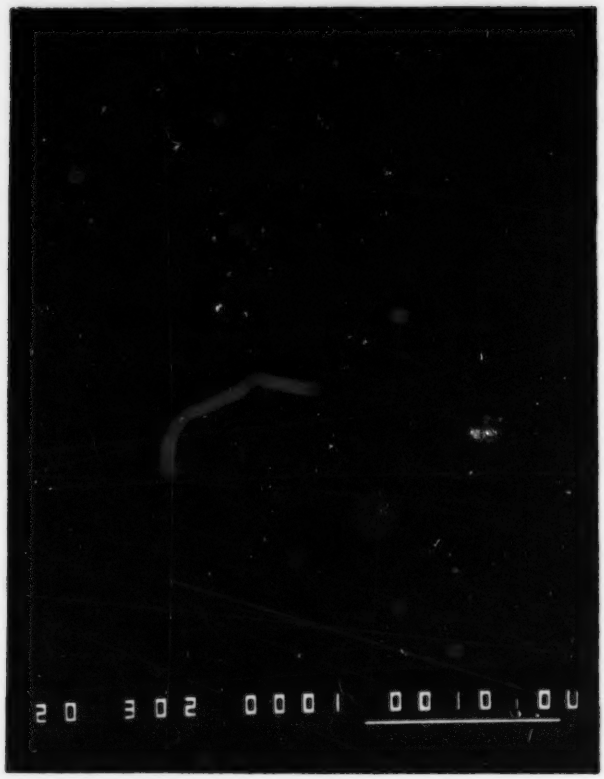

Figure 1. Backscattered electron image (BEI) which shows the typically very fine-grained diaphorite inclusions (black blebs) in galena. The scale bar is 10 micrometres in length.

ANALYTICAL PROCEDURES

All galena analyses were obtained by wavelength dispersive analysis using a JEOL-733 superprobe operated at 20 kV and a cup current of 40 nanoamperes with a 100 second counting period. The following X-ray lines and standards were used for galena analyses: AgLα using synthetic (Pb,Ag)S with 0.40 wt. % Ag, and BiMα using pure metal. A synthetic Ag-free PbS standard was used to determine background. The minimum detection levels (MDL) were found to be 0.02 wt. % (Ag) and 0.07 wt. % (Bi). Care was taken to avoid erroneous results due to fine-grained inclusions of silver minerals. Whenever unusually high Ag counts were obtained, a re-examination was performed with the backscattered electron detector at high magnification. For diaphorite, the analyses were

made at 20 kV, 15 nanoamperes and the following X-ray lines and standards were used: PbLα and SKα (synthetic PbS) and AgLα, BiMα, CuKα and SbLα (metals). Quantitative corrections for atomic number, absorption, and fluorescence effects were performed with Tracor Northern's ZAF program (Version 12).

RESULTS

A total of 112 galena grains from Sample "A" were randomly selected for analysis providing they were not less than 50 micrometres in width. The results are tabulated in Table 2 for a total of 350 spot analyses on the 112 grains.

43 spot analyses on 13 areas of 6 different samples of galena from Sample "B" are listed in Table 3. Three samples (85-2, 85-6 and 85-7) could not be analysed due to abundant fine-grained silver mineral inclusions (Table 5).

A total of 92 spot analyses on 31 areas of 9 galena samples from Sample "C" are tabulated in Table 4.

DISCUSSION

Sample "A"

For silver, all but one of 350 spot analyses gave values greater than the MDL of 0.02 wt. %, in contrast to about 90% of the analyses reported by Owens (1980) with a higher MDL (0.035 wt. %). The median value for all 350 analyses is 0.075 wt. % Ag with 94.5% of the analyses >0.02 and <0.13 wt. % Ag (Fig. 2A). The median value for all 112 grains analysed is 0.077 wt. % Ag with 95% of the analyses >0.03 and <0.12 wt. % Ag (Fig. 2B). This was calculated by using the median values for each grain (Table 2) and is very similar to the median value for all 350 spot analyses. The distribution of the analyses on two frequency plots (Fig. 2A & 2B) suggests one population. Furthermore, while it is not possible to predetermine the total number of grains that must

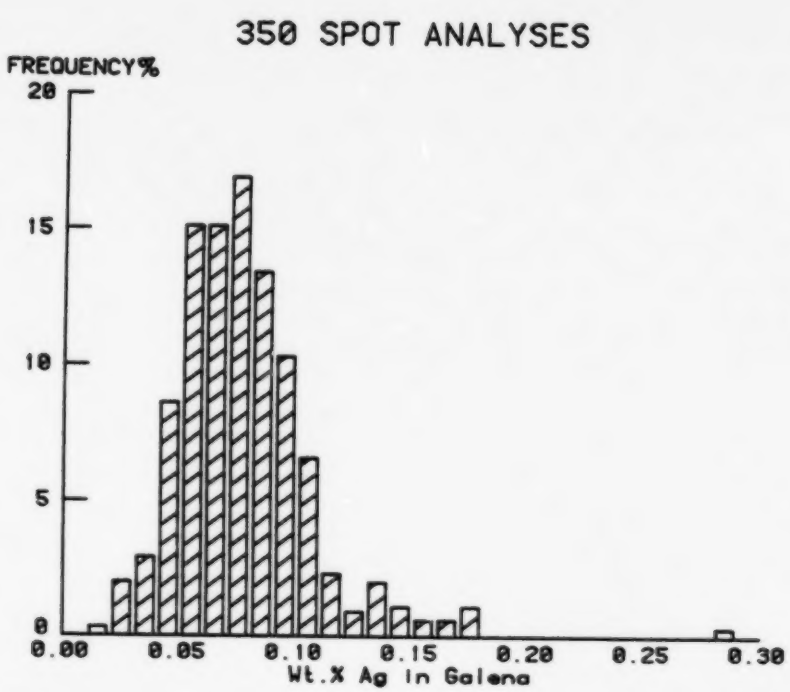

Figure 2A. Frequency distribution of silver in galena for 350 spot analyses. Sample "A".

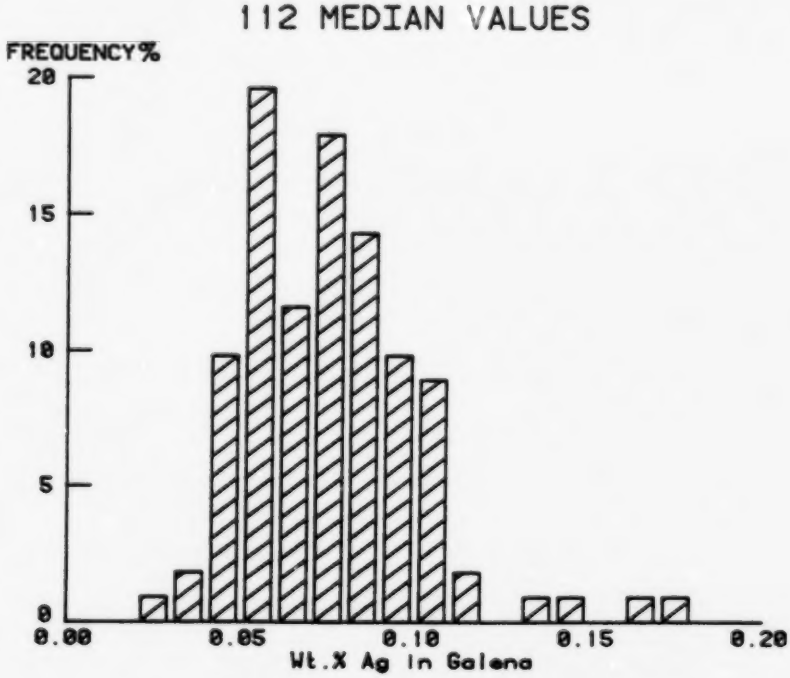

Figure 2B. Frequency distribution of silver in galena for 112 median values. Sample "A".

be analysed to obtain a truly representative value, the frequency distribution and the minimal variation within each grain suggests that the median value for all 350 analyses may be simply used as a representative value of silver in solid solution in galena for the sample analysed. The arithmetic mean of all 350 spot analyses is 0.077 wt. % Ag, nearly identical to the median value. High silver values are usually accompanied by high bismuth values. In cases where high silver values were not correlated with high bismuth, a stringent examination was made for possible inclusions of a silver mineral. Direct comparison with the mean Ag value of Owens (1980) is not possible because of the offsetting effect of the 10% of the analyses that had less than an MDL of 0.035 wt. % Ag (taken as 0% in his averaging calculations) and the report of several high Ag values, ranging up to 0.6 wt. % Ag. The slightly higher average value of 0.084 wt. % Ag calculated by Owens may be due to inclusion of the high Ag values in Owens' calculations or may represent a real difference between ore mined in 1977 and in 1985.

The Bi content varied from less than the MDL (0.07 wt. %) to a high value of 0.472 wt. % Bi. As mentioned above, high Bi values were usually associated with the higher Ag contents. The correlation coefficient with Ag is 0.7977 for all median Bi values above the MDL (Fig. 3).

Sample "B"

The median value of the medians obtained for the 13 areas analysed (Table 3) is 0.079 wt. % Ag. This compares very closely with the value considered representative of BMS galena mined in 1985 (Sample "A") but too few grains were analysed in this study for meaningful comparison. The presence of silver minerals in these higher grade (for Ag) samples suggests that the content of silver in solid solution in galena is not different from galena free of silver mineral inclusions. No conclusions can be drawn from the Bi content.

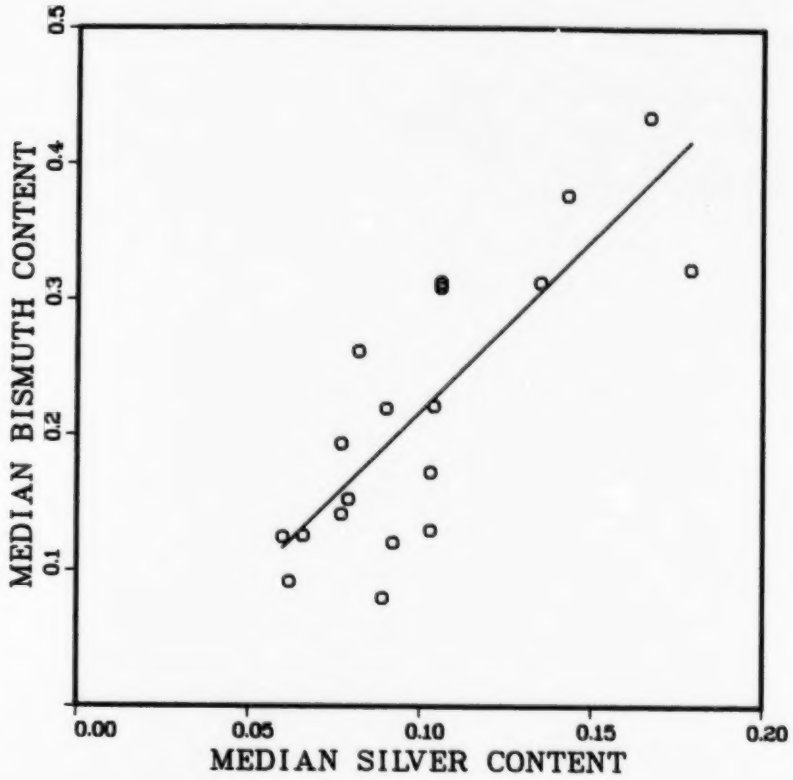

Figure 3. Correlation of Bi and Ag analyses.

Three of the largest diaphorite grains (from sample 85-6) were selected for quantitative analyses (Table 5). One of these grains is shown in Figure 4.

Sample "C"

As for sample "B", there are insufficient samples to calculate truly representative values for the Ag or Bi contents. However, the median value obtained from medians for 31 areas (Table 4) is 0.086 wt. % Ag.

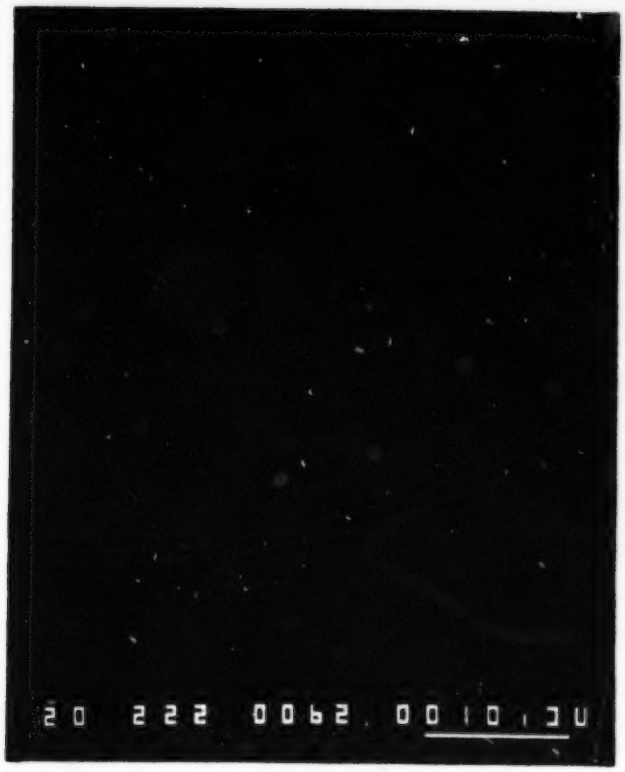

Figure 4. A diaphorite-boulangerite (light-grey) inclusion in galena. This is inclusion #4 in Table 5. The scale bar is 10 micrometres in length.

ACKNOWLEDGEMENTS

The authors are grateful to L.J. Surges and W.M. Luff for providing the samples and to Brunswick Mining and Smelting Corporation Limited (N.P.L.) for permission to make the results available, to A.I. Stemerowicz for the table concentrate, and to W.S. Bowman for the statistical plots.

REFERENCE

Owens, D.R., Silver distribution in mill products from Brunswick Mining and Smelting Corporation Limited, Bathurst, New Brunswick; Mineral Sciences Laboratory Report MRP/MSL 80-83 (IR); CANMET, Energy, Mines & Resources Canada; p. 23, 1980.

Table 1. Location in the mine and bulk silver contents of samples "B" and "C"

Sample No.	Location	
	SAMPLE "B"	g/t Ag*
85-2	425 Level, WOZ-44FW-remobilized ore	685
85-3	425 Level, 50, high-grade ore	153
85-4	575 Level, 48 FW-WOZ	127
85-6	575 Level, 90 STR-Pb-Ag ore	495
85-7	575 Level, 90 STR-Pb-Zn ore	152
85-11	725 Level, 20-N-EOZ	163
85-12	725 Level, 26-30 BN-MOZ	156
85-15	850 Level, FW Drift	200
85-17	850 Level, 78-6	135

	SAMPLE "C"			g/t Ag*
49	Main Ore Zone,	1400 Level, DDH	222-190	80-100
63	Main Ore Zone,	1400 Level, DDH	225-185	80-100
76	West Ore Zone,	1400 Level, DDH	432-155	135-180
82	West Ore Zone,	1400 Level, DDH	442-103	135-180
107	Main Ore Zone?,	1900 Level, DDH	1025-91	80-100
116	Main Ore Zone?,	1900 Level, DDH	1047-210	80-100
127	Main Ore Zone?,	1900 Level, DDH	1047-315	80-100
133	West Zone,	1900 Level, DDH	1076-310	135-180
140	Towards East Zone,	1900 Level, DDH	1420-136	110-130

*data provided by W.M. Luff.
**estimated.

Table 2. Ag and Bi contents of galena from secondary cyclone underflow ore sample (BMS) (Sample "A")

	wt. % Ag	Median Value	wt. % Bi	Median Value		wt. % Ag	Median Value	wt. % Bi	Median Value
Grain 1	0.054		<MDL		Grain 11	0.089		<MDL	
	0.045	0.054	<MDL	<MDL		0.084	0.084	<MDL	<MDL
	0.072		<MDL			0.083		<MDL	
Grain 2	0.063		<MDL		Grain 12	0.069		<MDL	
	<MDL	0.063	<MDL	<MDL		0.049	0.060	<MDL	<MDL
	0.069		<MDL			0.060		<MDL	
Grain 3	0.026		<MDL		Grain 13	0.180		0.288	
	0.045	0.045	<MDL	<MDL		0.179	0.179	0.327	0.323
	0.053		<MDL			0.285		0.320	
						0.172		0.377	
Grain 4	0.053		<MDL		Grain 14	0.119		<MDL	
	0.043	0.043	<MDL	<MDL		0.161		<MDL	
	0.037		<MDL			0.101	0.112	<MDL	<MDL
						0.112		0.081	
						0.092		<MDL	
Grain 5	0.058		<MDL		Grain 15	0.045		<MDL	
	0.053	0.056	<MDL	<MDL		0.071	0.053	<MDL	<MDL
	0.056		<MDL			0.053		<MDL	
Grain 6	0.103		<MDL		Grain 16	0.062		<MDL	
	0.097	0.097	<MDL	<MDL		0.064	0.063	<MDL	<MDL
	0.086		<MDL			0.063		<MDL	
Grain 7	0.034		<MDL		Grain 17	0.066		<MDL	
	0.055	0.055	<MDL	<MDL		0.060	0.060	<MDL	<MDL
	0.082		<MDL			0.057		<MDL	
Grain 8	0.077		<MDL		Grain 18	0.043		<MDL	
	0.080	0.077	<MDL	<MDL		0.056	0.043	<MDL	<MDL
	0.076		<MDL			0.043		<MDL	
Grain 9	0.069		<MDL		Grain 19	0.089		0.080	
	0.061	0.061	<MDL	<MDL		0.089	0.089	<MDL	0.080
	0.070		<MDL			0.093		0.094	
Grain 10	0.063		0.115		Grain 20	0.040		<MDL	
	0.060	0.060	0.125	0.125		0.074		<MDL	
	0.054		0.125			0.062	0.062	<MDL	<MDL
						0.088		<MDL	
						0.061		<MDL	

	wt. % Ag	Median Value	wt. % Bi	Median Value		wt. % Ag	Median Value	wt. % Bi	Median Value
Grain 21	0.031		<MDL		Grain 33	0.082		<MDL	
	0.043	0.033	<MDL	<MDL		0.066	0.082	<MDL	<MDL
	0.033		<MDL			0.087		<MDL	
Grain 22	0.077		0.194		Grain 34	0.084		<MDL	
	0.083	0.077	0.163	0.194		0.083	0.083	<MDL	<MDL
	0.073		0.201			0.071		<MDL	
Grain 23	0.053		<MDL		Grain 35	0.108		0.315	
	0.059	0.053	<MDL	<MDL		0.106	0.106	0.254	0.309
	0.037		<MDL			0.106		0.309	
Grain 24	0.095		<MDL		Grain 36	0.102		0.312	
	0.077		<MDL			0.106	0.106	0.315	0.312
	0.131	0.095	<MDL	<MDL		0.111		0.295	
	0.069		<MDL						
	0.126		<MDL						
Grain 25	0.094		<MDL		Grain 37	0.076		<MDL	
	0.092	0.094	<MDL	<MDL		0.090	0.090	<MDL	<MDL
	0.095		<MDL			0.097		<MDL	
Grain 26	0.059		<MDL		Grain 38	0.061		<MDL	
	0.046	0.048	<MDL	<MDL		0.071	0.065	<MDL	<MDL
	0.048		<MDL			0.065		<MDL	
Grain 27	0.085		<MDL		Grain 39	0.092		0.155	
	0.095	0.085	<MDL	<MDL		0.103	0.103	0.080	0.130
	0.068		<MDL			0.107		0.130	
Grain 28	0.091		<MDL		Grain 40	0.091		<MDL	
	0.091	0.091	<MDL	<MDL		0.099	0.091	<MDL	<MDL
	0.090		<MDL			0.084		<MDL	
Grain 29	0.078		<MDL		Grain 41	0.088		<MDL	
	0.063	0.077	<MDL	<MDL		0.079	0.088	<MDL	<MDL
	0.077		<MDL			0.098		<MDL	
Grain 30	0.059		<MDL		Grain 42	0.132		0.332	
	0.066	0.059	<MDL	<MDL		0.135	0.135	0.313	0.313
	0.058		<MDL			0.140		0.307	
Grain 31	0.101		<MDL		Grain 43	0.059		<MDL	
	0.077	0.090	<MDL	<MDL		0.054	0.059	<MDL	<MDL
	0.090		<MDL			0.077		<MDL	
Grain 32	0.138		0.356		Grain 44	0.096		<MDL	
	0.143	0.143	0.448	0.377		0.108	0.105	<MDL	<MDL
	0.154		0.377			0.105		<MDL	

	wt. % Ag	Median Value	wt. % Bi	Median Value		wt. % Ag	Median Value	wt. % Bi	Median Value
Grain 45	0.050		<MDL		Grain 56	0.054		<MDL	
	0.081	0.078	<MDL	<MDL		0.080	0.072	<MDL	<MDL
	0.078		<MDL			0.072		<MDL	
Grain 46	0.044		<MDL		Grain 57	0.044		<MDL	
	0.057		<MDL			0.061	0.044	<MDL	<MDL
	0.051	0.051	<MDL	<MDL		0.027		<MDL	
	0.051		<MDL						
	0.077		<MDL						
Grain 47	0.048		<MDL		Grain 58	0.066		0.163	
	0.042	0.048	<MDL	<MDL		0.058	0.066	0.084	0.126
	0.049		<MDL			0.080		0.126	
Grain 48	0.071		<MDL		Grain 59	0.158		<MDL	
	0.051	0.071	<MDL	<MDL		0.070	0.083	<MDL	<MDL
	0.074		<MDL			0.083		<MDL	
Grain 49	0.076		<MDL		Grain 60	0.053		<MDL	
	0.055	0.077	<MDL	<MDL		0.061	0.061	<MDL	<MDL
	0.079		<MDL			0.062		<MDL	
	0.092		<MDL						
Grain 50	0.080		<MDL		Grain 61	0.119		<MDL	
	0.107	0.080	<MDL	<MDL		0.082	0.119	<MDL	<MDL
	0.061		<MDL			0.148		<MDL	
Grain 51	0.074		<MDL		Grain 62	0.035		<MDL	
	0.066	0.068	<MDL	<MDL		0.041	0.038	<MDL	<MDL
	0.068		<MDL			0.038		<MDL	
Grain 52	0.074		0.244		Grain 63	0.056		<MDL	
	0.086	0.082	0.262	0.262		0.065	0.056	<MDL	<MDL
	0.082		0.273			0.056		<MDL	
Grain 53	0.091		<MDL		Grain 64	0.045		<MDL	
	0.074	0.082	<MDL	<MDL		0.075	0.054	<MDL	<MDL
	0.082		<MDL			0.054		<MDL	
Grain 54	0.022		<MDL		Grain 65	0.026		<MDL	
	0.026	0.026	<MDL	<MDL		0.070	0.050	<MDL	<MDL
	0.026		<MDL			0.050		<MDL	
Grain 55	0.079		<MDL		Grain 66	0.114		<MDL	
	0.113	0.087	<MDL	<MDL		0.069		<MDL	
	0.087		<MDL			0.093	0.102	<MDL	<MDL
						0.111		<MDL	

	wt. % Ag	Median Value	wt. % Bi	Median Value		wt. % Ag	Median Value	wt. % Bi	Median Value
Grain 67	0.070		<MDL		Grain 79	0.092		<MDL	
	0.077		<MDL			0.094		<MDL	
	0.088	0.074	<MDL	<MDL		0.037	0.087	<MDL	<MDL
	0.063		<MDL			0.082		<MDL	
Grain 68	0.045		<MDL		Grain 80	0.060		<MDL	
	0.072	0.045	<MDL	<MDL		0.045	0.053	<MDL	<MDL
	0.043		<MDL			0.053		<MDL	
Grain 69	0.088		0.110		Grain 81	0.057		<MDL	
	0.092	0.092	0.121	0.121		0.052	0.057	<MDL	<MDL
	0.123		0.151			0.059		<MDL	
Grain 70	0.099		0.221		Grain 82	0.105		<MDL	
	0.109	0.104	0.223	0.222		0.101	0.105	<MDL	<MDL
						0.139		<MDL	
Grain 71	0.069		<MDL		Grain 83	0.091		<MDL	
	0.058	0.058	<MDL	<MDL		0.067	0.086	<MDL	<MDL
	0.052		<MDL			0.086		<MDL	
Grain 72	0.099		<MDL		Grain 84	0.097		<MDL	
	0.145	0.109	<MDL	<MDL		0.090	0.097	<MDL	<MDL
	0.109		<MDL			0.131		<MDL	
Grain 73	0.091		0.220		Grain 85	0.110		0.323	
	0.090	0.090	0.195	0.220		0.106	0.106	0.313	0.313
	0.085		0.232			0.084		0.294	
Grain 74	0.089		<MDL		Grain 86	0.061		<MDL	
	0.076	0.077	<MDL	<MDL		0.051	0.051	<MDL	<MDL
	0.077		0.084			0.042		0.078	
Grain 75	0.082		<MDL		Grain 87	0.075		0.093	
	0.037	0.052	<MDL	<MDL		0.053	0.074	0.072	0.072
	0.052		<MDL			0.074		<MDL	
Grain 76	0.053		0.158		Grain 88	0.150		0.472	
	0.085		0.142			0.175	0.167	0.424	0.435
	0.077	0.077	0.141	0.142		0.167		0.435	
	0.077		0.155						
	0.064		0.118						
Grain 77	0.103		0.173		Grain 89	0.042		<MDL	
	0.100	0.103	0.144	0.173		0.087	0.055	<MDL	<MDL
	0.116		0.178			0.055		<MDL	
Grain 78	0.099		<MDL		Grain 90	0.098		<MDL	
	0.077	0.077	<MDL	<MDL		0.097	0.098	<MDL	<MDL
	0.055		<MDL			0.103		<MDL	

	wt. % Ag	Median Value	wt. % Bi	Median Value		wt. % Ag	Median Value	wt. % Bi	Median Value
Grain 91	0.097 0.073 0.095	0.095	<MDL <MDL <MDL	<MDL	Grain 102	0.075 0.103 0.098	0.098	<MDL <MDL <MDL	<MDL
Grain 92	0.076 0.078 0.086	0.078	<MDL <MDL <MDL	<MDL	Grain 103	0.079 0.084 0.069	0.079	<MDL <MDL <MDL	<MDL
Grain 93	0.078 0.075 0.093	0.078	<MDL <MDL <MDL	<MDL	Grain 104	0.059 0.051 0.080	0.059	<MDL <MDL <MDL	<MDL
Grain 94	0.061 0.029 0.042	0.042	<MDL <MDL <MDL	<MDL	Grain 105	0.058 0.067 0.062	0.062	0.092 <MDL 0.095	0.092
Grain 95	0.051 0.041	0.046	<MDL <MDL	<MDL	Grain 106	0.066 0.086 0.070	0.070	<MDL <MDL <MDL	<MDL
Grain 96	0.063 0.048 0.047	0.048	<MDL <MDL <MDL	<MDL	Grain 107	0.079 0.089 0.060	0.079	0.153 0.077 0.166	0.153
Grain 97	0.073 0.066 0.066	0.066	<MDL <MDL <MDL	<MDL	Grain 108	0.094 0.124 0.086	0.094	<MDL <MDL <MDL	<MDL
Grain 98	0.075 0.067 0.071	0.071	<MDL <MDL <MDL	<MDL	Grain 109	0.105 0.083 0.087	0.087	<MDL <MDL <MDL	<MDL
Grain 99	0.077 0.049 0.054	0.054	<MDL <MDL <MDL	<MDL	Grain 110	0.050 0.064 0.056	0.056	<MDL <MDL <MDL	<MDL
Grain 100	0.076 0.077 0.090	0.077	<MDL <MDL <MDL	<MDL	Grain 111	0.068 0.082 0.058	0.068	<MDL <MDL <MDL	<MDL
Grain 101	0.065 0.068 0.078	0.068	<MDL <MDL <MDL	<MDL	Grain 112	0.069 0.073 0.075 0.066	0.071	<MDL 0.107 <MDL <MDL	<MDL

Table 3. Ag and Bi contents of galena from some Brunswick #12 high-grade coarse-grained ore samples (1985) Sample "B".

	Wt. % Ag	Median Value	Wt. % Bi	Median Value
Sample 85-3	0.093		<MDL	
Sample 85-4	0.089		<MDL	
	0.068	0.078	<MDL	<MDL
	0.076		<MDL	
	0.080		<MDL	
Sample 85-11	0.080		0.075	
area 1	0.082	0.082	<MDL	<MDL
	0.112		<MDL	
area 2	0.088		0.083	
	0.092	0.088	<MDL	0.083
	0.077		0.096	
area 3	0.101		0.118	
	0.104	0.101	<MDL	0.086
	0.084		0.086	
Sample 85-12	0.080		<MDL	
area 1	0.064	0.075	<MDL	<MDL
	0.075		<MDL	
area 2	0.067		<MDL	
	0.057	0.067	<MDL	<MDL
	0.072		<MDL	
area 3	0.069		<MDL	
	0.069	0.069	<MDL	<MDL
	0.059		<MDL	
Sample 85-15	0.095		<MDL	
	0.106		<MDL	
	0.060	0.091	<MDL	<MDL
	0.091		<MDL	
	0.087		<MDL	
Sample 85-17	0.073		<MDL	
area 1	0.086		<MDL	
	0.075		<MDL	
		0.076		<MDL
	0.088		<MDL	
	0.064		<MDL	
	0.076		<MDL	
area 2	0.073		<MDL	
	0.091	0.075	<MDL	<MDL
	0.075		<MDL	
area 3	0.074		<MDL	
	0.080	0.080	<MDL	<MDL
	0.086		<MDL	
area 4	0.084		<MDL	
	0.062	0.079	<MDL	<MDL
	0.079		<MDL	

Table 4. Ag and Bi contents of galena from various Brunswick #12 samples collected by CANMET personnel (1975) Sample "C".

	Wt. % Ag	Median Value	Wt. % Bi	Median Value
Sample 49	0.094		<MDL	
area 1	0.080	0.093	<MDL	<MDL
	0.093		<MDL	
area 2	0.099		<MDL	
	0.078	0.099	<MDL	<MDL
	0.110		<MDL	
area 3	0.097		<MDL	
	0.077	0.097	<MDL	<MDL
	0.100		<MDL	
Sample 63	0.037		<MDL	
area 1	0.044		<MDL	
		0.041		<MDL
	0.041		<MDL	
	0.042		<MDL	
area 2	0.046		<MDL	
	0.026	0.035	<MDL	<MDL
	0.035		<MDL	
area 3	0.031		<MDL	
	<MDL	0.031	<MDL	<MDL
	0.049		<MDL	
area 4	0.028		<MDL	
	0.022	0.022	<MDL	<MDL
	<MDL		<MDL	
Sample 76	0.092		<MDL	
area 1		0.091		<MDL
	0.089		<MDL	
area 2	0.066		<MDL	
	0.077	0.077	<MDL	<MDL
	0.107		<MDL	
area 3	0.124		<MDL	
	0.083	0.101	<MDL	<MDL
	0.101		<MDL	
area 4	0.085		<MDL	
	0.112	0.090	<MDL	<MDL
	0.090		<MDL	

	Wt. % Ag	Median Value	Wt. % Bi	Median Value
Sample 82	0.128		<MDL	
area 1	0.134	0.128	<MDL	<MDL
	0.091		<MDL	
area 2	0.097		<MDL	
	0.151	0.097	<MDL	<MDL
	0.070		<MDL	
area 3	0.062		<MDL	
	0.075	0.075	<MDL	<MDL
	0.078		<MDL	
area 4	0.089		<MDL	
		0.086		<MDL
	0.083		<MDL	
Sample 107	0.096		<MDL	
area 1	0.085		<MDL	
		0.090		<MDL
	0.079		<MDL	
	0.101		<MDL	
Sample 116	0.086		<MDL	
area 1	0.095	0.086	<MDL	<MDL
	0.067		<MDL	
area 2	0.097		<MDL	
		0.090		<MDL
	0.083		<MDL	
Sample 127	0.068		<MDL	
area 1	0.065	0.065	<MDL	<MDL
	0.057		<MDL	
area 2	0.077		<MDL	
	0.098	0.077	<MDL	<MDL
	0.060		<MDL	
area 3	0.066		<MDL	
	0.066	0.066	<MDL	<MDL
	0.069		<MDL	
area 4	0.056		<MDL	
	0.058	0.058	<MDL	<MDL
	0.065		<MDL	
area 5	0.066		<MDL	
	0.064	0.064	<MDL	<MDL
	0.061		<MDL	

	Wt. % Ag	Median Value	Wt. % Bi	Median Value		Wt. % Ag	Median Value	Wt. % Bi	Median Value
Sample 133	0.200		0.547		Sample 140	0.060		<MDL	
area 1	0.195	0.195	0.586	0.567	area 1	0.063	0.063	<MDL	<MDL
	0.190		0.567			0.064		<MDL	
area 2	0.202		0.529		area 2	0.067		<MDL	
	0.182	0.201	0.548	0.548		0.079	0.076	<MDL	<MDL
	0.201		0.596			0.076		<MDL	
area 3	0.199		0.603		area 3	0.063		<MDL	
	0.189	0.197	0.585	0.603		0.077	0.063	<MDL	<MDL
	0.197		0.615			0.058		<MDL	
area 4	0.198		0.537		area 4	0.079		<MDL	
	0.207	0.198	0.609	0.537		0.072	0.072	<MDL	<MDL
	0.192		0.531			0.071		<MDL	

Table 5. Electron microprobe analyses of diaphorite from sample 85-6

Weight per cent

	Pb	Ag	Cu	Sb	Bi	S	Totals	# spots
Inclusion 1	32.74	23.10	0.25	25.30	0.08	18.35	99.82	6
Inclusion 2	30.72	23.83	0.28	25.58	0.14	18.56	99.11	2
Inclusion 4	30.86	24.23	0.30	25.97	0.14	18.27	99.77	2
Ave	31.44	23.72	0.28	25.62	0.12	18.39	99.57	

Atomic proportions*

	Pb	Ag	Cu	Sb	Bi	S
Inclusion 1	2.19	2.96	0.05	2.88	<0.01	7.92
Inclusion 2	2.04	3.04	0.06	2.89	0.01	7.96
Inclusion 4	2.05	3.09	0.06	2.94	0.01	7.85
Ave	2.09	3.03	0.06	2.90	0.01	7.91

*Calculated on a total of 16 atoms, ideally $Pb_2Ag_3Sb_3S_8$. Observed deviation from stoichiometry can be partly attributed to secondary fluorescence and absorption from the galena matrix due to the small size and geometry of these inclusions.